

Types of boredom: An experience sampling approach

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Abstract The present study investigated different types of boredom as proposed in a four-categorical conceptual model by Goetz and Frenzel (2006; doi:[10.1026/0049-8637.38.4.149](https://doi.org/10.1026/0049-8637.38.4.149)). In this model, four types of boredom are differentiated based on degrees of valence and arousal: indifferent, calibrating, searching, and reactant boredom. In two studies (Study 1: university students, $N = 63$, mean age 24.08 years, 66 % female; Study 2: high school students, grade 11, $N = 80$, mean age 17.05 years, 58 % female), real-time data were obtained via the experience-sampling method (personal digital assistants, randomized signals). Boredom experiences ($N = 1,103/1,432$ in Studies 1/2) were analyzed with respect to the dimensions of valence and arousal using multilevel latent profile analyses. Supporting the internal validity of the

proposed boredom types, our results are in line with the assumed four types of boredom but suggest an additional, fifth type, referred to as “apathetic boredom.” The present findings further support the external validity of the five boredom types in showing differential relations between the boredom types and other affective states as well as frequency of situational occurrence (achievement contexts vs. non-achievement contexts). Methodological implications as well as directions for future research are discussed.

Keywords Boredom · Emotions · Achievement · Experience sampling

Introduction

...it is probable that the conditions and forms of behavior called ‘boredom’ are psychologically quite heterogeneous (Fenichel 1951, p. 349; see Fenichel 1934, for original German quote)

Boredom is a frequently experienced emotion¹ (Larson and Richards 1991; Nett et al. 2011) that due to its prevalence is often described as a plague of modern society (Klapp 1986; Pekrun et al. 2010; Spacks 1995). Despite potential benefits of boredom under specific situational conditions (e.g., in initiating creative processes and greater self-reflection, Seib and Vodanovich 1998; see Vodanovich 2003a for an overview), empirical evidence strongly

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¹ As boredom is not a prototypical or basic emotional experience (e.g., Ekman 1984; Rosch 1978; Shaver et al. 1987), it has alternatively been classified in terms of constructs such as affect or mood.

indicates that boredom corresponds to a number of detrimental experiences and behaviors. For example, boredom has been found to relate to nicotine and alcohol consumption (Amos et al. 2006), drug use (Anshel 1991), stress and health problems (Thackray 1981), juvenile delinquency (Newberry and Duncan 2001), truancy (Sommer 1985), dropout at school (Bearden et al. 1989), and negative achievement outcomes (Goetz et al. 2006, 2007b; Pekrun et al. 2010, 2009).

Given the high frequency of boredom in various situations encountered in daily life and the variety of detrimental experiences to which boredom is related, it is rather surprising that to date there has been little research conducted on this specific emotion (Pekrun et al. 2002, 2010; for reviews see Vodanovich 2003b and Smith 1981). One possible reason for this neglect is that boredom represents an inconspicuous or “silent” emotion as compared to more intensive and consequently more easily observable affective states such as anger or anxiety (for the school context see Goetz et al. 2007a). Further, from the perspective of clinical practice, people’s experiences of boredom are also not typically regarded as relevant to psychopathological diagnoses, in contrast to anxiety or hopelessness/helplessness (cf., Miller and Seligman 1975; Zeidner 1998, 2007). Finally, boredom is not a prototypical emotion (Shaver et al. 1987) and has no prototypical facial expression (Ekman 1984).

In addition to research questions that pertain to the prevalence, effects, and detection of boredom experiences, a more fundamental question exists concerning the conceptual definition of boredom. From the perspective of component-process definitions of emotions (Kleinginna and Kleinginna 1981; Scherer 2000), boredom consists of affective components (unpleasant, aversive feelings), cognitive components (altered perceptions of time), physiological components (reduced arousal), expressive components (facial, vocal, and postural expression; for body movements and postures related to boredom see Wallbott 1998), as well as motivational components (motivation to change or leave the situation; see Goetz and Frenzel 2006; Johnstone and Scherer 2000; Pekrun et al. 2010). From this perspective, boredom shares certain characteristics with other emotional experiences (e.g., motivational component—motivation to escape the situation is also salient in anxiety) but at the same time it is clearly different from these emotions (e.g., physiological component—reduced arousal is not typical for anxiety).

In addition to the need to conceptually define this construct, there remains the need to also qualify the potential conceptual dimensions underlying experiences of boredom. As opposed to operational definitions, this approach reflects a more specific way of classifying emotional experiences along multiple dimensions. This dimensional

approach is highlighted in the well-known circumplex models of affect (Russell 1980; see also Watson and Tellegen 1985), in which affective states are characterized by two orthogonal dimensions of valence and arousal. In dimensional approaches, boredom has mainly been outlined as an unpleasant emotional state of relatively low negative *valence* (slightly unpleasant on average; e.g., Fisher 1993; Goetz et al. 2007a; Perkins and Hill 1985). Whereas the valence assumption is rather consistent in this relatively small research literature, findings concerning the dimension of *arousal* associated with boredom are mixed. For example, several researchers have classified boredom as a low-arousal emotion (e.g., Hebb 1955; Mikulas and Vodanovich 1993; Titz 2001), whereas others have described it as a high-arousal emotion (e.g., Berlyne 1960; London et al. 1972; Rupp and Vodanovich 1997; Sommers and Vodanovich 2000). Consequently, there exists an ongoing research debate as to whether boredom is best understood as a low- or high-arousal emotional experience (Pekrun et al. 2010; for both low and high arousal, see Harris 2000), and further, an unanswered research question as to why findings concerning the arousal associated with boredom are so varied in nature.

The notably heterogeneous theoretical assumptions and empirical results with respect to the arousal dimension of boredom can be traced back to classic statements in psychoanalytic literature from the 1930s, in which the multifaceted nature of this emotion was hypothesized (see statement by Austrian psychoanalyst Fenichel 1934, 1951 above). To our knowledge, this idea did not receive significant attention in the scientific community until it was echoed over six decades later by Phillips (1993) who suggested that boredom does not appear to represent a single entity, but rather multiple “boredoms” (p. 78; i.e., “types” of boredom).

With respect to recent empirical studies concerning potential boredom types, findings from a qualitative study by Goetz and Frenzel (2006) suggest that individuals do indeed report experiencing different types of boredom—not only with respect to arousal but also valence. One methodological shortcoming of the study by Goetz and Frenzel (2006) was that it relied on retrospective self-reports that may have been adversely affected by recall biases or cognitive schemas about emotions rather than actual experiences (Robinson and Barrett 2010; Robinson and Clore 2002; Roseman et al. 1996). In an effort to more comprehensively evaluate the utility of the multiple boredom types approach, the present study analyzed empirical data collected in real-life situations. More specifically, our study explored the longstanding assumption that a theoretical model consisting of multiple boredom types may better reflect individuals’ actual experiences of this emotion in everyday life as compared to existing models, from

which mixed results are obtained. The first goal of the study was to contribute to the boredom literature by addressing the possibility that the boredom arousal controversy may be the result of assessing *different boredom types* associated with differing levels of arousal. The second goal was to explore potential differences in boredom experiences with respect to varying degrees of valence as suggested by the preliminary findings of Goetz and Frenzel (2006). The latter study explored the extent, to which the slightly negative valence typically associated with boredom may simply reflect an average across boredom subtypes, each differing to some extent in how unpleasant they are.

A model of boredom experiences

Boredom types: Valence and arousal dimensions

Goetz and Frenzel (2006) proposed a conceptual model consisting of four different types of boredom that were derived through qualitative interview data concerning the phenomenology of boredom in academic settings. Fifty-ninth-graders (50 % female, $M_{\text{age}} = 14.86$) were asked to “Imagine someone who does not know how it feels to be bored. Please try to describe to him or her how it feels.” After responding to this domain-general question, students were asked to mentally recall a domain-specific boredom experience, namely, a class they perceived as boring in nature. Based on a component model of emotions (Scherer 1984, 2000), students were then asked the following questions: “What did you think when you were bored?” (cognitive component), “What would you have liked to have done most when you were bored?” (motivational component), and “How did your body feel when you were bored?” (physiological component).

Consistent with the aforementioned assumptions regarding the existence of types of boredom (e.g., Fenichel 1934, 1951; Phillips 1993), students’ responses to all interview questions were rather heterogeneous and often contradictory in nature. For example, with respect to the first domain-general question regarding how boredom feels, students’ responses referred to relaxation (36 %) and tiredness/inertness (34 %) as well as need for activity (22 %), aggression (12 %), and unrest (12 %). In an attempt to identify coherent themes across participants’ heterogeneous statements, the authors adopted the well-known circumplex model of affect (Russell 1980; see also Watson and Tellegen 1985) in which discrete affective states are characterized by the orthogonal dimensions of valence and arousal. It is important to note that in Goetz and Frenzel (2006), it was the *subtypes* of boredom that were classified along these two dimensions (within-emotion classification) rather than discrete emotional

experiences (e.g., boredom vs. enjoyment). The authors identified four types of boredom differing in their level of valence as well as arousal (see Fig. 1).

The first boredom type was labeled “*indifferent boredom*” and assumed to correspond with low arousal and slightly positive valence. Statements reflecting indifferent boredom included descriptors such as relaxation and cheerful fatigue, and reflected a general indifference to, and withdrawal from, the external world. The second boredom type, referred to as “*calibrating boredom*,” was associated with higher (but still relatively low) arousal compared to indifferent boredom and slightly negative valence. Statements reflecting calibrating boredom indicated wandering thoughts, not knowing what to do, and a general openness to behaviors aimed at changing the situation or cognitions unrelated to the situation. Thus, calibrating boredom represented a slightly unpleasant emotional state associated with receptiveness to boredom-reducing options but not actively searching for alternate behaviors or cognitions.

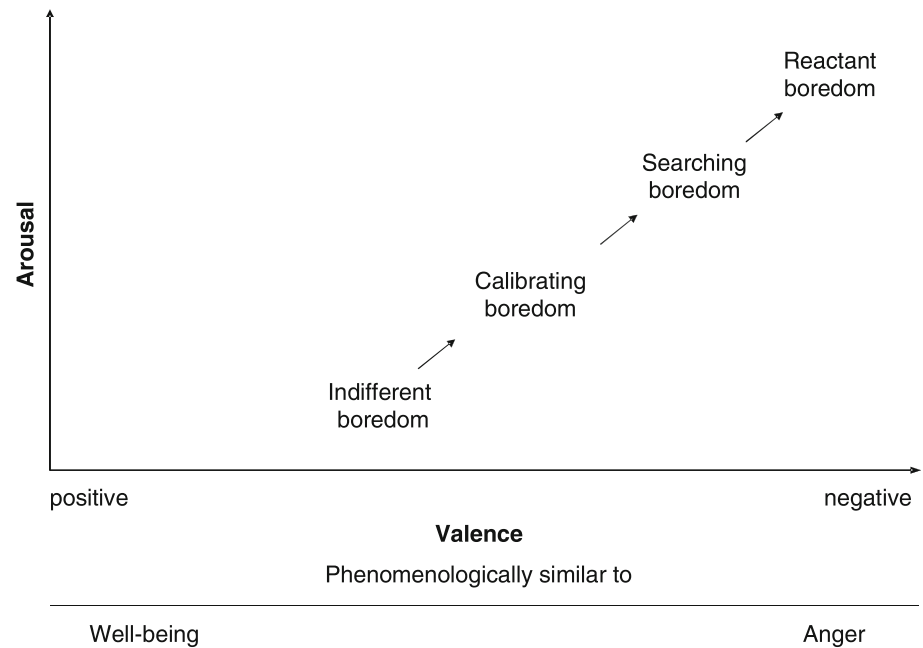
The third boredom type was labeled “*searching boredom*” and was characterized by a more negative valence and higher arousal than calibrating boredom. Students’ statements describing searching boredom reflected a sense of restlessness and an active search for alternative actions as evidenced by statements referring to the need for activity and specific thoughts about hobbies, leisure, interests, and school. This type of boredom was experienced as rather unpleasant and was associated with not only being generally open to, but actively seeking out specific ways of minimizing feelings of boredom.

The fourth and final boredom type was classified as “*reactant boredom*” and was characterized by the highest levels of arousal and negative valence. Statements reflecting reactant boredom indicated a strong motivation to leave the boredom-inducing situation and avoid those responsible for this situation (e.g., teachers). Students discussed significant restlessness, aggression, as well as persistent thoughts about specific, more highly valued alternative situations. This final boredom type was thus experienced as very unpleasant in nature and was strongly associated with a need to escape the situation. The four boredom types may develop from one type into another based on situational factors (e.g., searching boredom may develop into reactant boredom in a tedious classroom setting).

Boredom types: Relations to other affective states

According to the boredom types proposed by Goetz and Frenzel (2006), each boredom type should differentially correspond with other positive and negative affective states in accordance with its degree of valence (from positive to negative; see Fig. 1, x axis). Boredom types that are slightly negative, or even positive in valence, should be

Fig. 1 Localization of boredom types relative to negative valence and arousal (adapted from Goetz and Frenzel 2006)



more strongly associated with positive affective states (e.g., enjoyment) and less strongly associated with negative affective states (e.g., anger). Conversely, boredom types characterized by high negative valence should correlate more strongly with negative affective states and less strongly with positive affective states. Empirical findings demonstrating the assumed differential relations between boredom types and other affective measures, in a manner consistent with the increasing levels of negative valence from the first to the fourth boredom type, would serve to support the external validity of the four boredom types.

Boredom types: Situational prevalence

Preliminary findings by Goetz and Frenzel (2006) suggest that the prevalence of each boredom type may differ as a function of contrasting situational characteristics, for example, non-achievement situations as compared to classroom settings. As non-achievement situations typically afford greater degrees of freedom with respect to the choice or termination of activities (e.g., leisure time), types of boredom that are lower in negative valence (e.g., indifferent boredom) may be more prevalent in non-achievement settings than in situations experienced at school or at work where activity selection and withdrawal opportunities are more limited. Conversely, boredom types that are higher in negative valence (e.g., reactant boredom) are assumed to be more strongly associated with achievement situations (e.g., classroom activities) as compared to non-achievement situations (e.g., shopping).

Goetz and Frenzel (2006) further stated the boredom types may change over time. However, due to the availability of

withdrawal opportunities in non-achievement situations, boredom types of relatively low negative valence (e.g., searching boredom) may not often develop into boredom types of high negative valence (e.g., reactant boredom). That is, in non-achievement situation students are likely to change the activity or the situation before boredom types of extreme negative valence can develop. Hence, quantitative findings indicating the anticipated differences in the situational prevalence of the boredom types would provide empirical support for the external validity of the proposed boredom typology.

Research hypotheses

Based on an in-depth qualitative assessment, Goetz and Frenzel (2006) proposed a conceptual model distinguishing between four types of boredom as a function of differential degrees of valence and arousal. Using real-time data obtained via the experience sampling method, the current quantitative study evaluated the afore-mentioned assumptions that follow from these preliminary findings. More specifically, we anticipated that the proposed four-part classification of boredom types would be empirically confirmed (Hypothesis 1), that the proposed boredom types would correspond with other affective states in a manner consistent with increasing levels of negative valence (Hypothesis 2), and finally, that these boredom types would differ as anticipated with respect to situational characteristics (Hypothesis 3). Thus, whereas Hypothesis 1 focuses on the internal validity of the proposed four boredom types, Hypotheses 2 and 3 evaluate the external validity of the four-part boredom typology with respect to other affective states and across different situations.

Hypothesis 1: Boredom types

We anticipated that four types of boredom classified based on the dimensions of valence and arousal would be observed in real-life settings. More specifically, we expected to find four boredom types differentiated in a two-dimensional space with the first dimension representing valence (from positive to negative valence) and the second dimension reflecting arousal (from low to high arousal; see Fig. 1).

Hypothesis 2: Relations of boredom types with other affective states

We further expected that the four boredom types would correspond with other affective states (positive and negative) in a pattern consistent with the increasing levels of negative valence of four boredom types. Indifferent, calibrating, searching, and reactant boredom were each expected to relate more negatively than the previous type to positive affective states, and each boredom type (in that same order) was also expected to relate more positively than the previous type to negative affective states.

Hypothesis 3: Prevalence of boredom types

Finally, we hypothesized that the prevalence of the four proposed boredom types would be moderated by the specific characteristics of a given situation. Boredom types of positive or low negative valence and low arousal were expected to be more frequently experienced in *non-achievement situations*. In contrast, boredom types that are high in negative valence and arousal were expected to be more often experienced in *achievement situations*.

Method

Sample and data collection

To investigate our research hypotheses, two studies were conducted employing similar data collection protocols but different samples (university students vs. high school students). The studies thus allow for tests of generalizability across different age groups while controlling for potential method biases.

Study 1

The first sample consisted of 63 German university students (66 % female) with a mean age of 24.08 years ($SD = 4.14$; range = [19.92; 45.08]). Students participated on a voluntary basis and were recruited primarily from psychology courses (45 %) and education programs (35 %). The

remaining participants (20 %) were enrolled in Sociology, Law, Arts, Physics, Politics, Literature, and Sports programs.

Data were collected using the experience sampling method (Csikszentmihalyi and Larson 1987; Hektner et al. 2007). Following initial instruction on how to use the personal digital assistant (PDA) devices, students' PDA responses were assessed over a two-week period (the instructor was contacted in case of technical problems). Consistent with the aim of obtaining representative data on individuals' experiences throughout an entire day, our assessment employed a time randomizing procedure (signal-contingent sampling; see Hektner et al. 2007), in which the number of signals, the earliest and latest possible signal, as well as the minimal time lag were used as default parameters. More specifically, the PDAs emitted six audible signals per day between 10 a.m. and 10 p.m., after which participants were asked to immediately complete a digital questionnaire on the PDA screen. When this was not feasible (e.g., during exams), participants were instructed to complete the questionnaire as soon as possible thereafter prior to the questionnaire expiring 5 min later. Students who could not complete the questionnaire immediately were instructed to describe their current experiences (i.e., a state assessment) and were explicitly informed not to retrospectively describe their experiences when the signal occurred in order to minimize recall bias.

Study 2

The second sample consisted of 80 German high school students (58 % female) from grade 11 with a mean age of 17.05 years ($SD = 0.54$; range = [15.92; 18.58]). Participants were randomly selected from 25 classrooms from 9 German high schools (school type: Gymnasium). With few exceptions, German high school classes occur on weekday mornings between approximately 8 a.m. and 1 p.m., with students completing homework or having leisure time in the afternoon hours.

As in Study 1, data collection employed the experience sampling method, in which students were provided the PDA devices and instructed to activate their device whenever they attended a class in a core school subject (i.e., mathematics, German, or English). Core subjects were selected as they were required of all students and to restrict the time commitment for this study. Upon activating the device, it emitted an audible signal within the next 40 min (combination of event and signal-contingent sampling; see Hektner et al. 2007). In addition, students were randomly signaled three times between 2 p.m. and 10 p.m. on weekdays and 6 times between 10 a.m. and 10 p.m. on weekends (signal-contingent sampling; focus was homework or leisure activities). Students were requested to complete the digital questionnaire on the PDA screen immediately following each

auditory signal, and if responding later (e.g., during an exam), to refer to their current experiences as opposed to their experiences when the signal occurred (the questionnaire expired if not completed within 5 min). To minimize classroom disruption, class teachers were informed of the study protocols, all teachers agreed to student participation, and the number of participants did not exceed four students per class (total class size was ~30 students).

Study measures

The same set of variables was assessed in Studies 1 and 2 using single items. Each of the study variables was assessed with respect to the specific activity in which students were currently engaged (cf., Clore 1994), thus providing a clearer and more direct assessment of state experiences than would global measures pertaining to more general situations (see Goetz et al. 2013).

Current activity

To determine the specific nature of the situation in which participants completed the state questionnaires, the item “What is the main type of activity in which you are currently engaged?” was provided with the following two response options: (1) an achievement activity (e.g., classes, lectures, studying in the library, homework, studying at home, job setting), and (2) not an achievement activity (e.g., sleeping, eating, leisure time). Thus, subjects were prompted to answer whether they regarded their current activity as a situation in which achievement was or was not salient. Based on students’ responses, a dichotomous variable indicating the situation type during survey completion was constructed (achievement = 1, non-achievement = 0).

Intensity of boredom and other affective states

The intensity of students’ current emotional experiences, subjective well-being, and satisfaction were assessed using multiple single-item measures with each item formulated as follows: “While engaging in this activity, how strongly do you experience [construct].” The specific constructs assessed included (1) boredom, (2) well-being, (3) satisfaction, (4) enjoyment, (5) anger, and (6) anxiety. The response format for each item was a 5-point Likert scale ranging from 1 (*not at all*) to 5 (*very strongly*).

Valence and arousal associated with boredom experiences

Following responses of 2 or higher on the questionnaire item on boredom intensity—indicating that, at minimum, a small intensity of boredom was being experienced—the questionnaire presented two follow-up items measuring the

perceptions of valence and arousal that were associated with the boredom experience (conditional assessment). The items for both valence and arousal were formulated as follows: “At this moment, how does it feel to be bored?” By formulating questions this way, students were explicitly instructed to refer to boredom when answering this question (even if other emotions might have been also experienced by students at this moment). Response options for *valence* consisted of a 5-point Likert scale ranging from 1 (*positive*) to 5 (*negative*), with higher scores indicating greater *negative* valence, and for *arousal* included a 5-point Likert scale ranging from 1 (*calm*) to 5 (*fidgety*).

Data analysis

As the focus of the present study was on types of academic boredom, only those assessments in which students reported a minimum of intensity of boredom (at least 2 on the Likert scale) were included in the analyses. Data obtained in both studies reflect a two-level structure, with measures at specific assessment points nested within persons. The two-level structure of the data was taken into account in our analyses through the use of complex commands in Mplus 5.2 software (Muthén and Muthén 2007).

Hypothesis 1

To address Hypothesis 1 (boredom types; H1), latent profile analysis (LPA; Muthén and Muthén 2000) was conducted to identify responses that have similar patterns of valence and arousal [LPA is also known as a latent class analysis (LCA) when conducted with observed continuous variables]. The conceptual goal of an LPA is to detect heterogeneity in a sample so as to reveal homogenous subsamples of responses that share a similar pattern (in our case, groups of assessments within students; Muthén 2001). However, LPA differs from cluster analysis in that it is model-based and probabilistic in nature (Nylund et al. 2007).

Latent profile analysis assumes that a categorical latent variable underlies the observed outcome variables and determines the structure of the response pattern, thus defining the class membership. More specifically, LPA seeks to identify the smallest number of latent classes that sufficiently describe the association between observed variables. Latent classes are created in such a way that indicator variables are statistically independent within classes. For this study, the latent classes were expected to represent the boredom types. To determine the optimal number of classes, the Bayesian Information Criterion (BIC; Schwarz 1978) was used. The BIC accounts for the log likelihood of a model, the number of model parameters, and the sample size (Nylund et al. 2007). BIC values thus

provide relative information about different models, with lower BIC values corresponding to better models. The BIC has been found in Monte Carlo simulations to perform well compared to other fit indices in identifying the correct number of underlying classes (Nylund et al. 2007).

Hypothesis 2

To address Hypothesis 2 (associations between boredom types and other affective states; H2), the means for the criterion constructs consisting of well-being, satisfaction, enjoyment, anger, and anxiety were assessed for each of the boredom types. The most likely class membership calculated by the LPA is a probability-based score, and analyses based solely on this measure do not account for the possibility that boredom experiences that belong to the same class may markedly differ in their probabilities of class membership (Clark and Muthén 2009). To account for such differences, an Mplus feature allowing for mean comparisons on the basis of pseudo-class draws was employed (Wang et al. 2005). In this analysis, several random draws are made from each individual's posterior probability distribution to determine class membership, resulting in different pseudo-groups between which mean comparisons regarding auxiliary aspects can be computed (Clark and Muthén 2009).

Hypothesis 3

To address Hypothesis 3 (associations between boredom types and situation type) the analytical procedure adopted for Hypothesis 2 was applied. The analysis allows us to compare the means of each assumed boredom type between the levels of the dichotomous variable distinguishing between non-achievement and achievement situations.

Results

Descriptive statistics

Descriptive analyses of boredom experiences indicated that among participants in Study 1/2 (university/high school samples), 63/80 students reported at least some degree of boredom (at least 2 on the Likert scale) on 1,103/1,432 assessments out of a total of 3,945/3,645 assessments. Of the assessments on which boredom was indicated, 587/947 were submitted in a reported achievement situation and 516/485 were completed in a reported non-achievement situation.

Table 1 presents means and standard deviations of boredom valence, boredom arousal, well-being, satisfaction, enjoyment, anger, and anxiety for participants who

Table 1 Means and standard deviations of scales

	Study 1				Study 2			
	Bored		All assessments		Bored		All assessments	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Valence	3.34	1.24	– ^a	– ^a	3.46	1.21	– ^a	– ^a
Arousal	2.50	1.25	– ^a	– ^a	2.05	1.20	– ^a	– ^a
Well-being	2.73	1.02	2.94	1.19	2.53	1.22	2.94	1.37
Satisfaction	2.72	1.03	2.91	1.19	2.51	1.20	2.94	1.34
Enjoyment	2.48	1.03	2.70	1.19	2.28	1.20	2.78	1.40
Anger	1.85	1.04	1.62	1.03	1.80	1.14	1.56	1.02
Anxiety	1.56	0.91	1.50	0.91	1.44	0.89	1.34	0.82

Study 1: university student sample. Study 2: high school student sample. Answer formats were 1 (*positive*) to 5 (*negative*) for negative valence, 1 (*calm*) to 5 (*fidgety*) for arousal, and 1 (*not at all*) to 5 (*very strongly*) for well-being, satisfaction, enjoyment, anger, and anxiety. Bored = assessments indicating a magnitude of at least 2 on the boredom item. Bored: Study 1 *N* = 1,103 assessments in 63 university students; Study 2 *N* = 1,432 assessments in 80 high school students. All assessments: Study 1 *N* = 3,945 assessments in 63 university students; Study 2 *N* = 3,645 assessments in 80 high school students. In these analyses, the two-level structure of the data was taken into account

^a Valence and arousal were assessed exclusively for situations in which boredom was experienced

reported a minimum of intensity of boredom (at least 2 on the Likert scale; see “bored” column) as well as for all assessments across participants (see “all assessments” column).

The correlation between the dimensions of valence and arousal was rather small in Study 1 ($r = .23$; $p < .001$; university sample) and negligible in Study 2 ($r = -.05$; $p = .270$; high school sample). The strength of these correlations is consistent with the results of previous real-time assessments (Goetz et al. 2010).

Boredom types (H1)

Table 2 presents the results of the LPA. Due to the scaling of our variables (valence, arousal), the maximum number of classes could be 25 (5×5). For both samples, the BIC was lowest for a solution indicating five latent classes. The entropy of the five-class solution was 0.94/0.89 in Study 1/2 indicating a satisfactory certainty for class membership. The probabilities of class membership by latent class are presented in Table 3. In Study 1/2, the probabilities that an assessment classified as belonging to latent class k in fact belongs to class k range from [0.74; 1.00]/[0.79; 1.00] with a mode of each 1.00. These results indicate that assessments within students can with satisfactory certainty be assigned to five latent classes as outlined by the LPA. LPA

Table 2 Information criteria values of class solutions for boredom classes

	Number of classes														
	Study 1							Study 2							
	1	2	3	4	5	6	7	1	2	3	4	5	6	16	19
No. of free param.	4	7	10	13	16	19	19	4	7	10	13	16	19	16	19
Loglikelihood	-3,616.51	-3,520.04	-3,468.26	-3,439.08	-3,230.15	-3,221.12	-3,221.12	-4,577.79	-4,351.04	-4,247.61	-3,605.30	-3,578.19	-3,578.19	-3,578.19	-3,578.19
BIC	7,261.05	7,089.13	7,006.57	6,969.24	6,572.40	6,575.34	6,575.34	9,184.64	8,752.92	8,567.85	7,305.02	7,272.60	7,294.39	7,272.60	7,294.39
Entropy		0.74	0.83	0.81	0.94	0.98	0.98		0.92	0.89	1.00	0.89	0.84	0.89	0.84

BIC Bayesian Information Criterion. The two-level structure of the data was taken into account. Study 1—university student sample: $N_{Level\ 1} = 1,103$, $N_{Level\ 2} = 63$; Study 2—high school student sample: $N_{Level\ 1} = 1,432$, $N_{Level\ 2} = 80$

provides probability scores for each boredom assessment concerning latent class membership, resulting in five different scores for each boredom assessment in the present study. The probability score for latent membership in a specific class indicates the probability of belonging to this class. For each boredom assessment, the five probability scores of latent class membership thus correspond to the five classes (that when summed add up to 1). These probability scores of latent class membership were subsequently logit-transformed for the purposes of linear regression analyses (Clark and Muthén 2009).

Table 4 provides means for arousal and valence, as well as numbers of assessments within classes for the five classes identified by the LPA. The results are notably similar for Studies 1 and 2 (university/high school samples). Class 1 is characterized by slightly positive valence (2.13/2.30 for Studies 1 and 2, respectively; values below the midpoint of the 5-point scale ranging from *positive* [1] to *negative* [5]) and very low arousal (1.00/1.00; also clearly below the midpoint of the scale ranging from *calm* [1] to *fidgety* [5]). Classes 2 and 3 have relatively similar valence levels (scale ranging from positive to negative; 3.20/3.31 for Class 2; 3.33/3.41 for Class 3) but differ with Class 2 reflecting lower levels of arousal (2.00/2.00) than Class 3 (3.00/3.00). Class 4 is characterized by high levels of both negative valence (3.81/3.67) and arousal (4.41/4.26). Class 5 is characterized by high levels of negative valence (4.07/4.16) combined with low levels of arousal (1.00/1.00). It is important to note that the integers in the class means concerning the arousal variable are a result of the LPA algorithm that aims to obtain maximum homogeneity within classes. As the two variables (valence, arousal) are each measured on an ordinal, 5-point Likert scale, and the variances of arousal were relatively small due to maximal homogeneity within classes, integer values were produced. However, beyond the integer values observed for the arousal dimension, there is considerable variance in the valence variable for each class (standard deviations in Study 1 for Classes 1–5: 0.85/1.14/0.94/1.30/0.48; standard deviations in Study 2 for Classes 1–5: 0.49/0.96/1.04/1.32/0.89).

With respect to Hypothesis 1, mean levels in valence and arousal related to Classes 1–4 reflect the proposed boredom types, with Class 1 representing “*indifferent boredom*,” Class 2 representing “*calibrating boredom*,” Class 3 representing “*searching boredom*,” and Class 4 representing “*reactant boredom*.” However, Class 5 was not anticipated. According to its levels of valence and arousal, we labeled this type of boredom “*apathetic boredom*.”

To investigate how strongly boredom intensity was related to latent boredom classes, means of boredom intensity of the latent classes as indicated by the LPA were calculated. Further, we calculated correlations between the probability scores for latent class membership and boredom

Table 3 Probabilities of latent class membership by latent class

Latent class	Probability of latent class membership									
	Study 1					Study 2				
	1	2	3	4	5	1	2	3	4	5
1	0.74	0.00	0.00	0.00	0.26	0.89	0.00	0.00	0.00	0.11
2	0.00	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00
3	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
4	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00	0.00
5	0.10	0.00	0.00	0.00	0.90	0.21	0.00	0.00	0.00	0.79

Study 1—university student sample: $N = 1,103$; Study 2—high school student sample: $N = 1,432$. The sum of probability values of membership for a given latent class (row) is equal to 1

Table 4 Means and standard deviations (arousal, valence) for the five boredom classes and number of measures within latent classes

Latent class	Boredom type	Study 1			Study 2		
		<i>M</i>		No. measures within class	<i>M</i>		No. measures within class
		Valence	Arousal		Valence	Arousal	
1	Indifferent	2.13	1.00	178	2.30	1.00	153
2	Calibrating	3.20	2.00	331	3.31	2.00	297
3	Searching	3.33	3.00	244	3.41	3.00	253
4	Reactant	3.81	4.41	244	3.67	4.26	214
5	Apathetic	4.07	1.00	106	4.16	1.00	510

Study 1: university student sample. Study 2: high school student sample. Response formats were 1 (*positive*) to 5 (*negative*) for valence and 1 (*calm*) to 5 (*fidgety*) for arousal. The variances are fixed in the analysis using the Mplus standard procedure. Study 1: $SD_{\text{arousal}} = 0.23$; $SD_{\text{negative valence}} = 1.11$. Study 2: $SD_{\text{arousal}} = 0.17$; $SD_{\text{negative valence}} = 1.02$

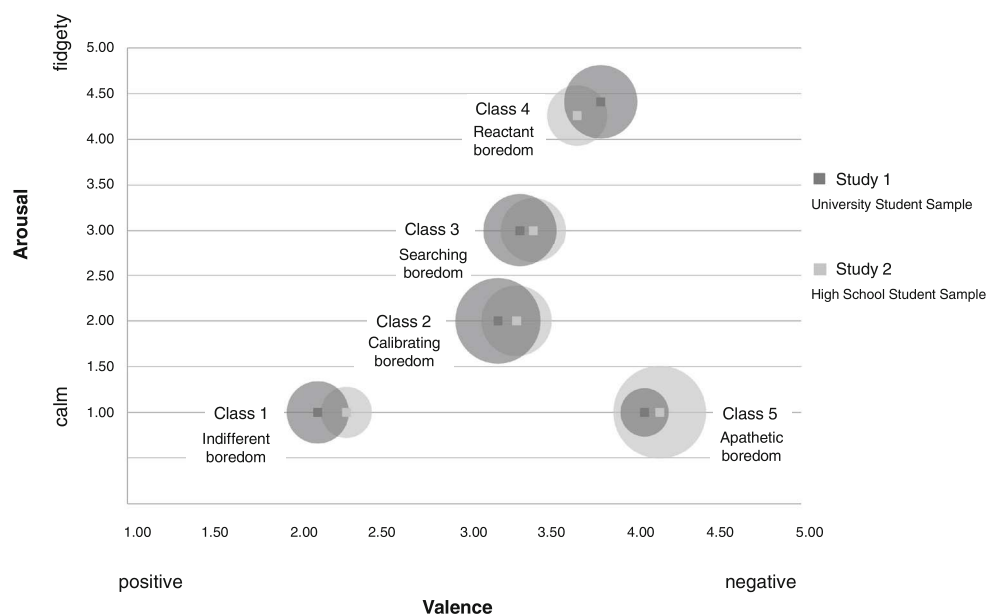
intensity. For both analyses, logit-transformed probabilities of class membership were used. Means and standard errors (in parentheses) of boredom intensity for latent Classes 1–5 in Study 1 (university student sample) were: 2.53 (0.07)/2.61 (0.04)/2.64 (0.05)/3.27 (0.07)/2.85 (0.09); and in Study 2 (high school student sample) were: 2.80 (0.07)/3.06 (0.06)/3.17 (0.06)/3.48 (0.08)/3.33 (0.06). Thus, in both studies an increasing intensity from Class 1 to Class 4 was found, and Class 5 showed a level of boredom intensity between those found for Classes 3 and 4. However, the range in boredom intensity across Classes 1–5 was rather small in both studies (the difference between the highest and the lowest value was 0.74/0.68 in Study 1/2, with possible difference of 4.00 in both studies). This finding indicates that the probability scores for latent class membership were not strongly related to boredom intensity. Correlations between the logit-transformed probabilities of boredom class membership and the variable of boredom intensity for Classes 1–5 were for Study 1: $-.08$ ($p = .030$)/ $-.12$ ($p = .011$)/ $-.09$ ($p = .027$)/ $.30$ ($p < .001$)/ $-.04$ ($p = .386$); and for Study 2: $-.09$ ($p = .011$)/ $-.06$ ($p = .048$)/ $.00$ ($p = .902$)/ $.13$ ($p = .002$)/ $.01$ ($p = .746$). In Study 1, one correlation of medium size (0.30) was found for Class 4 (reactant boredom). As the

correlation was also positive and significant in Study 2 (0.13), the observed tendency was for the logit-transformed probabilities of being a member of Class 4 to coincide with higher levels of boredom intensity. However, it is important to note that the effect sizes of the correlations observed were negligible or small in magnitude.

The relative frequencies of Classes 1–4 were similar for Studies 1 and 2 (see Table 4). However, they were different for Class 5 (*apathetic boredom*), with 10 % in Study 1 (university students) and 36 % in Study 2 (high-school students).

In order to explore whether the different boredom types occur randomly within individuals over time, or whether there was a higher probability for some individuals to experience specific types of boredom relative to others, we obtained intraclass correlations (ICCs) of the probability scores of the boredom class membership across assessment points. ICCs of the probability scores of the boredom class membership for Classes 1/2/3/4/5 were as follows: Study 1 = $.22$ ($p < .001$)/ $.10$ ($p < .001$)/ $.09$ ($p < .001$)/ $.18$ ($p < .001$)/ $.24$ ($p < .001$); (median: $.18$); Study 2 = $.19$ ($p < .001$)/ $.06$ ($p = .002$)/ $.19$ ($p < .001$)/ $.11$ ($p < .001$)/ $.08$ ($p < .001$); (median: 0.11 ; for both studies, each ICC

Fig. 2 Mean values of negative valence and arousal for latent boredom classes. *Note* Dots within circles indicate the mean levels of valence and arousal for each class in each study. Circle size represents the relative number of measures for each class



value was significantly different from zero). These scores indicate that a large proportion of the variance (cf., Papaioannou et al. 2004) of the probability of experiencing a specific boredom type was within-person variance. However, as these scores were significantly different from zero, and 7 of the 10 scores were above or equal to 0.10 (a threshold suggested by Papaioannou et al. 2004), this also suggests that a meaningful, albeit relatively small, proportion of variance was between-person variance indicating a higher probability for some individuals to experience specific types of boredom relative to others.

Results indicating the five-class solutions observed in both Studies 1 and 2 are presented graphically in Fig. 2. Dots within the circles (dark-colored: Study 1; light-colored: Study 2) indicate mean levels of negative valence and arousal for the five classes in each study (see Table 4). For both studies, the size of the circles (circular areas) represents the number of assessments (across all subjects) within each class relative to the total number of assessments (also across all subjects). Thus, the sizes of circular areas for the two studies are directly comparable. This figure illustrates that aside from differences in the relative frequency of boredom classes, virtually identical results were observed in both studies with respect to the number of classes indicated by the LPA and their locations on the dimensions of negative valence and arousal.

Relations between boredom types and other affective states: H2

Figure 3 depicts mean levels of well-being, satisfaction, enjoyment, anger, and anxiety associated with each of the five boredom classes for both the university student sample

(Study 1) and the high school student sample (Study 2). For each of the five constructs in both studies, boredom classes were generally found to differ with respect to mean levels (main effect $p < .001$; based on an Mplus feature allowing pseudo-group comparisons by accounting for the probability of class membership; Clark and Muthén 2009). However, these differences were not significant for some between-class contrasts on specific constructs (e.g., Classes 4 and 5 did not differ on well-being in the high school sample).² Nevertheless, a clear overall picture emerged for both samples. Class 1 (*indifferent boredom*) corresponded with the most positive profile of emotions and well-being (relatively high means for positive emotions and well-being, relatively low means for negative emotions). Conversely, Class 4 (*reactant boredom*) was characterized by the most negative profile (relatively low means for positive emotions and well-being, relatively high means for negative emotions, especially for anger). The valences of the profiles on the criterion measures for Classes 2 (*calibrating boredom*) and 3 (*searching boredom*) were between the more extreme profiles observed for Classes 1 and 4. Finally, the profile found for Class 5 (*apathetic boredom*, not hypothesized) indicated relatively low levels of positive emotions, satisfaction, and well-being, as well as relatively low levels of negative emotions.

² With respect to Hypotheses 2 and 3, a total of 120 pairwise comparisons were calculated [for each construct 10 comparisons between the 5 classes \times 6 constructs (well-being, satisfaction, enjoyment, anger, anxiety, dichotomous variable achievement vs. non-achievement situation) \times 2 samples (university vs. high school student sample)]. Of the 120 comparisons, 18 were not significant in the university student sample and 22 were not significant in the high school student sample [in the case of significance: all $ps < .017$ for the university student sample; with one exception ($p = .037$) all $ps < .019$ for the high-school student sample].

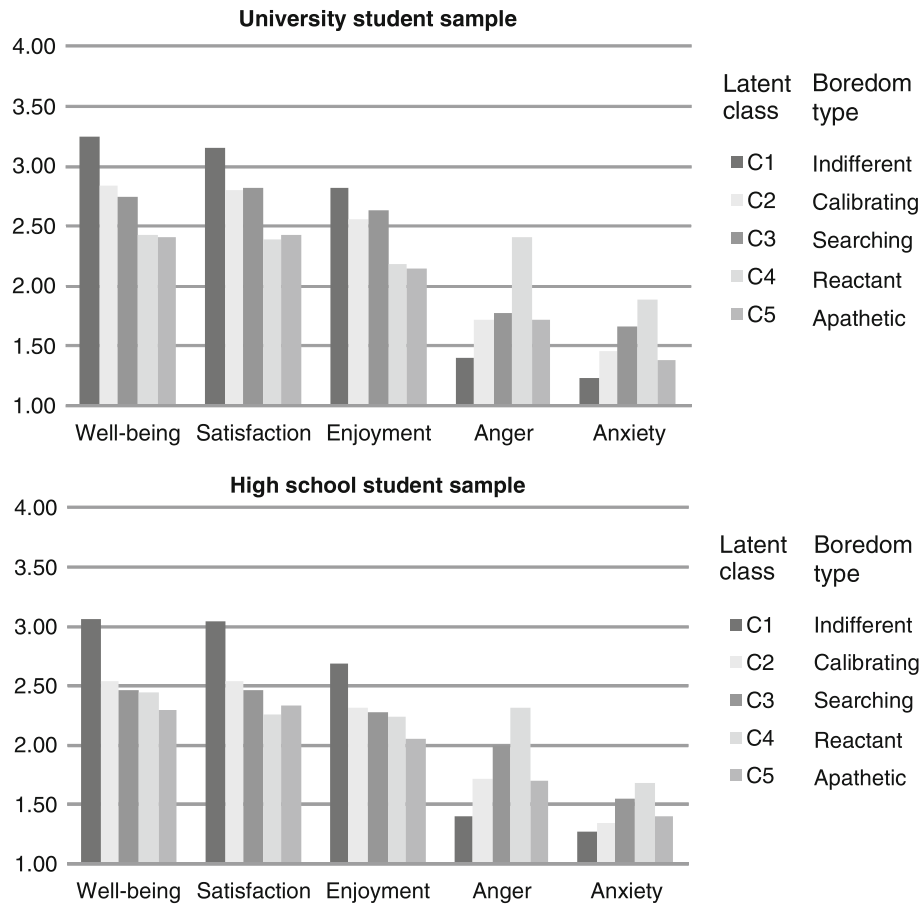


Fig. 3 Affective experiences in boredom classes. *Note* Means of Likert scale values from 1 to 5 of well-being, satisfaction, enjoyment, anger, and anxiety associated with each of the five latent boredom

classes both for the university student sample (Study 1) and the high school student sample (Study 2)

Relations between boredom types and situation type: H3

For each of the five boredom classes in the two study samples, the percentage of students' boredom experiences that were reported in an achievement situation, as compared to situations not related to achievement, was calculated.³ The mean percentages of boredom reports occurring in achievement situations corresponding to latent Classes 1 through 5 were for Study 1: 37/55/53/57/59; and for Study 2: 55/65/68/75/72. For both samples, the classes significantly differed with respect to the percentage of

boredom reports occurring in achievement situations ($p < .001$; based on an Mplus feature allowing pseudo-group comparisons by accounting for the probability of class membership; Clark and Muthén 2009). Beyond this main effect, however, not all classes differed from each other with respect to situation type (e.g., Classes 4 and 5 did not significantly differ for the high school sample; see footnote 2).

Concerning differences between the two studies, a greater proportion of boredom reports in achievement situations was found in Study 2 (high school students) relative to Study 1 (university students; Study 1/2: 53 %/ 66 %). Figure 4 shows the ratio of boredom reports occurring in achievement situations in relation to boredom reports occurring in non-achievement situations in one latent class. The reported values were calculated in two steps: First, the percentages of boredom reports occurring in achievement situations relative to all boredom reports were calculated separately for each latent class. Second, we divided these values by the overall percentage of boredom

³ Correlations (calculated across all assessments) between the affective state measures and the situation variable (coded as follows: 0 = non-achievement situation, 1 = achievement situation) were as follows for Studies 1/2: $-.30/-.32$ ($ps < .001$) for well-being; $-.28/-.14$ ($ps < .001$) for satisfaction; $-.28/-.31$ ($ps < .001$) for enjoyment; $.14/.06$ ($p = .011/.056$) for anger; $.16/.08$ ($p = .006/.026$) for anxiety.

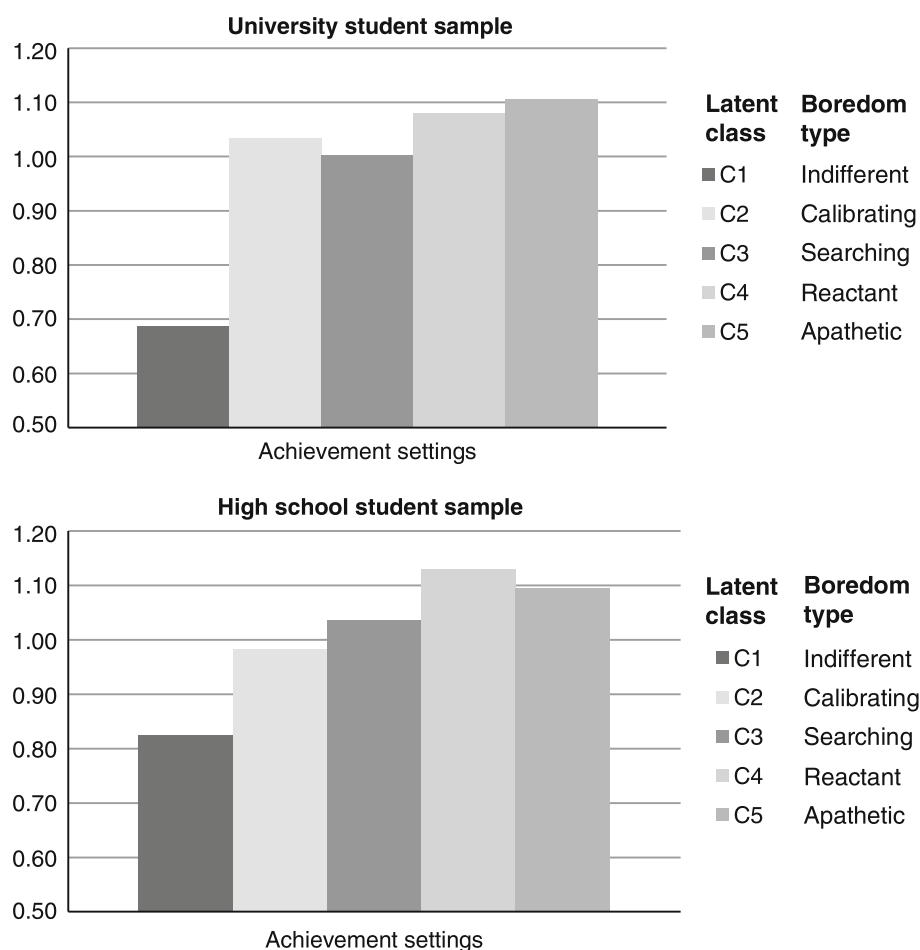


Fig. 4 Relative portion of achievement situations across boredom types. *Note* The values were calculated in two steps. In the first step, the percentage of boredom reports occurring in achievement situations in relation to all boredom reports was calculated separately for each latent class. In the second step, these values were divided by the overall percentage of boredom reports in achievement situations aggregated across boredom classes. Thus, a value above 1 means that

reports in achievement situations collapsed across boredom classes.

A relatively clear picture emerged for both studies: The values below 1 found for Class 1 (*indifferent boredom*) indicated that if boredom was reported among assessments in this latent class, there was a greater than chance probability that it was reported in a non-achievement context. In contrast, the values above 1 observed for Classes 4 (*reactant boredom*) and 5 (*apathetic boredom*) indicated an above-chance probability that boredom was instead reported in achievement settings in these classes. The values for Classes 2 (*calibrating boredom*) and 3 (*searching boredom*) fell between those for Classes 1 and 4/5, and were very close to 1, suggesting that the percentage of boredom reports occurring in achievement situations were similar to the percentages of boredom reports across situations.

this type of boredom was experienced with the above-chance probability in learning and achievement situations whereas a value below 1 means that this type of boredom was experienced with the above-chance probability in non-achievement situations

Discussion

The present research aimed to empirically investigate different types of boredom as experienced in real-life settings based on hypotheses derived from preliminary qualitative research by Goetz and Frenzel (2006). The study hypotheses proposed that individuals' boredom experiences may be differentiated with respect to valence (positive to negative) and arousal (Hypothesis 1), that boredom types should differ in relation to other affective states (Hypothesis 2), and that differential prevalence should be found for boredom experiences in achievement versus non-achievement situations (Hypothesis 3). Hypothesis 1 concerned the internal validity of the four-part boredom typology, whereas Hypotheses 2 and 3 addressed the external validity of the boredom types in relation to conceptually relevant constructs and situation types. Data from two experience

sampling studies evaluated these hypotheses with samples of university students (Study 1) and high school students (Study 2).

Boredom type classification

The primary aim of the present study was to classify individuals' boredom experiences along the dimensions of valence (positive to negative) and arousal. Thus, our study is in line with previous studies on discrete emotions that classify types of affective experiences according to the dimensions of valence and arousal as opposed to a single dimension (see Russell 1980; Watson and Tellegen 1985). In other words, this research aligns with previous studies in adopting a dimensional approach that takes the combination of two dimensions into account when classifying affective experiences. As an extension of previous studies, our focus is thus not on discrete emotional experiences (e.g., enjoyment, pride, relief, anger, anxiety, boredom), but rather on subtypes of one specific emotion, in this case subtypes of boredom.

In both studies, LPA results suggested five boredom classes—one more latent class than was initially observed by Goetz and Frenzel (2006). The first four classes observed in both studies were directly consistent with those found in Goetz and Frenzel's (2006) typology, and thus support the internal validity of the proposed four boredom types. Class 1 showed slightly positive valence and very low arousal, most closely reflecting "*indifferent boredom*" (relaxed, withdrawn, indifferent). Classes 2 and 3 had slightly negative valence and higher arousal than Class 1, with Class 3 having higher arousal than Class 2. Accordingly, whereas Class 2 appeared to represent "*calibrating boredom*" (uncertain, receptive to change/distraction), Class 3 more closely resembled "*searching boredom*" (restless, active pursuit of change/distraction). The fourth boredom type proposed by Goetz and Frenzel (2006), namely "*reactant boredom*," was represented by Class 4 in each study—a class having high levels of negative valence and relatively high levels of arousal (highly reactant, motivated to leave the situation for specific alternatives).

Finally, the fifth and unanticipated boredom type was characterized by a high level of negative valence and very low arousal. In contrast to the hypothesized boredom typology described above, this finding suggests an additional class of boredom experiences that are especially unpleasant and associated with very low arousal levels. Given the similarity of this construct description to learned helplessness or depression, this boredom type was referred to as "*apathetic boredom*."

In interpreting our findings concerning the different boredom types, an intuitive assumption may be that the specific boredom types in fact are determined by the overall intensity of the boredom experience (e.g., with indifferent

boredom being milder and less intense relative to reactant boredom). However, despite a consistent tendency across both studies for reactant boredom to correspond with higher levels of boredom intensity, the five types of boredom were rather weakly related to boredom intensity in terms of effect size. As such, the present findings provide empirical support for different boredom types, but not simply as a function of the intensity of the boredom experience.

To summarize, the present LPA results provide empirical support for the four hypothesized boredom types as differentiated based on the dimensions of valence and arousal. Further, these findings suggest that the constructs of *calibrating* and *searching* boredom (Classes 2 and 3) may be more similar than initially assumed with respect to valence and that an especially unpleasant and debilitating type of boredom similar to apathy may also be experienced in real-life situations.

More generally, the present research indicates that there exists a considerable degree of variance *within* the construct of boredom. This "*within-boredom-variance*" was observed not only with respect to the arousal dimension, consistent with prior mixed findings in the boredom literature, but also for the valence dimension, which contradicts prior limited findings that define experiences of boredom as having slightly low negative valence. Thus, the present research evaluated the relatively unexplored emotion of boredom and provided support for preliminary qualitative findings (Goetz and Frenzel 2006) as well as long-standing theoretical assertions that boredom may be best understood as multiple "boredoms" that differ based on valence and arousal.

Concerning the five boredom types observed in this research, an additional finding unrelated to the initial study hypotheses is also of interest: Individuals do not randomly experience the different boredom types over time but rather *tend to experience* specific types of boredom. This assertion is supported by a meaningful amount of between-person variance (up to 24 % of the total variance) found for the probability scores of experiencing the five boredom types (for an interpretation of the extent of between-person variance, see Papaioannou et al. 2004). Thus, we can speculate that experiencing specific boredom types might, to some degree, be interpreted as being due to personality-specific dispositions. Alternatively, the between-person variance in experiencing specific types of boredom might be due to differences between individuals in the boredom-arousing situations they encounter (e.g., some students taking a specific class that promotes reactant boredom).

Relations between boredom types and other affective states

To evaluate the external validity of the observed boredom types, relationships between boredom classes and other

affective states were assessed (as hypothesized based on boredom class valence; see Fig. 1, x axis). The present findings provide clear empirical support for the anticipated relations of boredom and a number of positive affective states (enjoyment, well-being, satisfaction) as well as several negative affective states (anger, anxiety).

In both studies, experiences of Class 1 boredom (*indifferent*) corresponded with a generally more positive profile than the other boredom types, a finding consistent with the assumptions of Goetz and Frenzel (2006). Further, Class 4 boredom (*reactant*) was instead associated with a significantly more negative profile. Class 5 boredom (*apathetic*), a subtype not initially proposed by Goetz and Frenzel (2006), was similar to Class 4 boredom with respect to the negative direction and the magnitude of relations with positively-valenced measures of enjoyment, well-being, and satisfaction. However, these more aversive boredom types were shown to differ significantly in their relations with the negative affective states of anger and anxiety with much lower levels of negative emotions being observed for Class 5 as compared to Class 4 boredom. To summarize, our findings provide empirical support for the external validity of the proposed boredom types and suggest that *indifferent* and *reactant* boredom represent the least and most aversive boredom experiences, respectively. Further, we demonstrated that *calibrating* and *searching* boredom types fell between these extremes with respect to valence. Finally, the fifth boredom type was shown to be associated with low levels of both positive and negative affective states (e.g., anger).

Prevalence of boredom types across situation types

In line with Hypothesis 3, the present data revealed that the relative frequency of boredom types that are positive or low in negative valence are more commonly experienced in non-achievement settings as compared to situations related to learning and achievement. Conversely, we found that the relative frequency of boredom types of high negative valence were lower in non-achievement settings as compared to achievement situations. Additionally, the relative frequency of Class 1 boredom (*indifferent*) was shown to be higher in non-achievement related activities as compared to achievement contexts. This finding is consistent with the preceding results showing this first type of boredom to be the least unpleasant, even slightly pleasant, and thus, more likely to be tolerated in non-achievement settings than more aversive types of boredom. Further, this finding may be explained by non-achievement situations typically allowing for greater freedom to modify or escape boring activities than achievement settings (for boredom-specific coping strategies, see Nett et al. 2010, 2011). In addition to situational factors, there might also be an interaction of situation and person variables leading to the

experience of specific boredom types. For example, extroverts might be more prone than introverts to experience reactant boredom in situations that are hard to modify or to leave (cf., Hill and Perkins 1985; Smith 1981).

With respect to the possible positive aspects of boredom experiences (Seib and Vodanovich 1998; see Vodanovich 2003a for a review), it may be assumed that different types of boredom can differ with respect to their potential to initiate positive thoughts and actions. For instance, indifferent boredom experienced mainly in non-achievement settings may be related to constructive behaviors such as stimulating greater self-reflection and creativity (cf., Baird et al. 2012; Harrison 1984; Sio and Ormerod 2009). At the same time, the potential benefits of boredom in more restrictive achievement situations may be more limited. Further, our studies revealed that indifferent boredom was the least commonly experienced boredom type (16 % in university students, 11 % in high school students). Hence, the potential benefits associated with this type of boredom are likely to be outnumbered by the negative consequences of more aversive boredom types (cf., Pekrun et al. 2010).

A fifth boredom type: The case for apathetic boredom

The results of our analyses suggest that the preliminary model of boredom experiences proposed by Goetz and Frenzel (2006) should be expanded to include the fifth boredom type: *apathetic boredom*. This boredom experience appears to be especially unpleasant, but differs from the other highly aversive boredom type—reactive boredom—in corresponding with low arousal and the absence of both positive and negative affective states. Thus, whereas reactive boredom is highly aversive and is associated with high arousal, apathetic boredom is equally aversive yet lacking in arousal—an emotion type more similar to learned helplessness or depression (cf., Fenichel 1934, 1951 for an early statement on this relationship). This pattern is consistent with empirical findings showing positive relations between boredom and depression (Farmer and Sundberg 1986; Vodanovich 2003b). Of particular concern is the relative frequency of *apathetic boredom* observed in the present research, namely with respect to the high school student sample in which it comprised 36 % of boredom experiences.

A five-class boredom typology

Expanding upon the preliminary model suggested by Goetz and Frenzel (2006), findings from the present research based on quantitative data obtained from real-time assessments provide empirical support for the five-class model of boredom experiences. As outlined in Fig. 5, four boredom types are distinguished based on valence

(positive to negative) and arousal, with the fifth boredom type (*apathetic boredom*) not falling in sequence with the others due to having very high negative valence combined with very low arousal. Our data further revealed that *calibrating* and *searching boredom* were more similar than the other boredom types with respect to the valence dimension. It is also important to note that the empirically derived model differs from the initially hypothesized model with respect to the relations between boredom types and phenomenologically similar constructs. Although the assumed relations to relevant constructs were found for the four hypothesized boredom types, the assumption that more negative types of boredom would coincide with other negative affective states was not fully supported by our data. More specifically, *apathetic boredom* was found to be highly aversive yet corresponded with low levels of *both* positive *and* negative affective states. However, it is important to note that as only the negative activating emotions of anger and anxiety were assessed in this study (Pekrun et al. 2002), it is possible that apathetic boredom might correspond with high levels of deactivating negative emotions such as sadness. Finally, unlike the hypothesized model, our model does not assume directional relations among boredom types as very little is known about the temporal transition from one boredom type to another.

In Fig. 5, the *average* level of valence and arousal when experiencing boredom is plotted in relation to the five observed boredom types. As indicated by the proximity of averaged boredom experiences to the *calibrating* and *searching boredom* types, the present findings suggest that

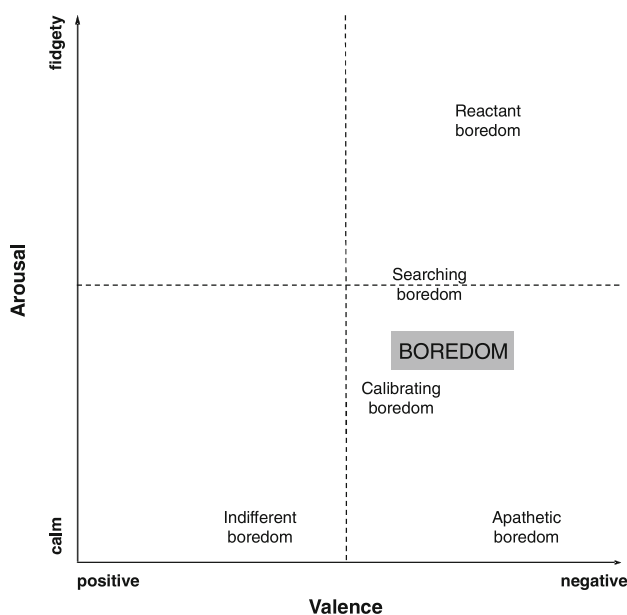


Fig. 5 Five boredom types and mean boredom along valence and arousal dimensions

these two specific classes of boredom experiences are most likely to represent the “typical” boredom experience from the perspective of emotion prototypes (e.g., Armstrong et al. 1983; Clore and Ortony 1991; Johnson-Laird and Oatley 1989; Ortony et al. 1987; Pekrun et al. 2010; Russel 1991). Moreover, our results significantly qualify this assertion in showing three types of boredom to be notably distant from this averaged boredom measure with respect to valence and arousal (*indifferent*, *reactant*, and *apathetic boredom*). The averaged boredom experience is located in the lower right quadrant of the figure—a classification based on valence and arousal that is in line with previous approaches to locating boredom according to its underlying dimensions (e.g., Russell 1980).

It is important to note that the response options for our arousal dimension ranged from *calm* to *fidgety*, with *fidgety* likely not reflecting maximum arousal as would more extreme anchors, such as “highly agitated” or “panicked” (cf., arousal scales ranging from “as calm as one can feel” to “as aroused as one can feel” in Reisenzein 1994). Thus, when comparing the present five-part boredom typology and averaged boredom against classical circumplex models, it is possible that all of the observed boredom types and averaged boredom may be located near the lower end of the arousal scale. In sum, our results (see Fig. 5) indicate that when plotted according to the classical dimensions of the circumplex model, the identified boredom types are primarily located in the quadrant reflecting negative valence and low arousal. At the same time, they seem to also reach or even extend beyond these borders into other quadrants (e.g., *indifferent boredom* as a low-arousal/pleasant experience, *reactant boredom* as a high-arousal/unpleasant experience).

Our findings do not contradict but rather expand the assumptions underlying circumplex models of affect in showing substantial *within*-boredom variance with respect to valence and arousal. As a consequence, from the perspective of circumplex models, a specific subtype of a discrete emotion might be rather similar to a specific subtype of another discrete emotion. For example, boredom that is negative in valence and high in arousal (i.e., *reactant boredom*) might be similar in valence and arousal to the “typical” experience of anger. However, although there might be an overlap in emotions with respect to their levels of valence and arousal, they may nonetheless differ in other ways not captured by two-dimensional circumplex models. For example, it is possible that further investigation of dimensionally similar emotion types based on component definitions of emotions (e.g., Kleinginna and Kleinginna 1981; Scherer 2000) could reveal differing components for emotions that are similar in terms of valence and arousal. In sum, although our approach is in line with circumplex models of emotions we do emphasize that the levels of

valence and arousal previously assigned in this model to boredom represent averaged values that do not exclude within-boredom variance. Moreover, we believe that similar degrees of within-emotion variance found for boredom may also be characteristic for other discrete emotions (cf., Wilson-Mendenhall et al., 2013).

Study limitations

One potential shortcoming of the present research concerns the samples assessed in that the two samples consisted of older students in higher levels of the educational system (university students and 11th grade students). Future research that includes samples of younger and/or older students (e.g., primary school students, mature university students) is needed to evaluate how strongly our results can be generalized across educational levels. Second, whereas the classroom represents a prototypical achievement setting in which boredom experiences can be analyzed, other relevant achievement settings such as workplace should also be investigated (e.g., office vs. manufacturing domains, full vs. part-time employment, etc.; cf., Grubb 1975; Pekrun and Frese 1992; Smith 1981; for a job-related boredom scale, see Lee 1986).

Third, due the present study aim to collect a broad sample of students' real-time experiences of boredom (randomized, no equidistant or continuous assessments), it was not possible to analyze the temporal ordering of different boredom types. For example, it is possible that searching boredom may precede reactant boredom in classroom settings as was initially hypothesized by Goetz and Frenzel (2006). Experimental studies in which boredom experiences are manipulated could help to inform the research literature on this emotion and shed light on the possible temporal ordering and development of the proposed boredom types.

Fourth, and related to the previous point, the assumption that subtypes of boredom may be rapidly induced or manipulated by environmental factors, as opposed to gradually developing from one subtype into another over time with respect to changes in levels of valence and arousal might be investigated in future research (e.g., experimental studies). Future studies focusing on this aspect are further recommended to explore the use of more specific response formats (e.g., use of a slider) or multi-item scales assessing valence and arousal in order to have more continuous values on both constructs.

Finally, due to the restricted number of items in the state assessment (to not compromise the validity of the real-time assessment), the number of external variables used for validating qualitative differences between the boredom types was limited. Further, we did not gauge the extent to which the types of boredom differed with respect to the

component processes involved beyond the dimensions of valence and arousal. Future studies that investigate the degree to which the suggested boredom types share similarities with respect to specific components as outlined in component-process definitions of emotions are encouraged (e.g., with respect to the cognitive component: whether altered perceptions of time are found for all boredom types). Related to this point, future studies might also be designed to allow for an empirical investigation of whether students referred in their description of boredom to "pure" experiences of boredom or whether other emotions experienced at that time had an impact on those descriptions (cf., Van Tilburg and Igou 2012). In our study we cannot exclude the possibility that, to a certain degree, boredom types reflect mixed emotions (e.g., Larsen and McGraw 2011) despite our best efforts to ensure that students referred exclusively to boredom when answering questions about valence and arousal.

Conclusion and implications

The results of this study suggest that individuals indeed experience different types of boredom that may be qualified along the dimensions of valence and arousal. Future research is warranted in which these boredom types are further explored with respect to potentially differential relations with antecedent variables (cf., Daschmann et al. 2011), boredom-related coping strategies (e.g., Nett et al. 2011), or their effects on critical outcome variables (e.g., achievement; cf., Pekrun et al. 2010).

In addition, an intriguing avenue for future research concerns the development of scales to better evaluate differential, in vivo experiences of boredom (state assessments of boredom types). For example, reactant boredom could be assessed as follows: "How strongly do you experience boredom at this moment" (from 1 [*not at all*] to 5 [*very strongly*]). Given a minimum level of boredom reported, reactant boredom could be assessed with items like "I feel restless at this moment", "I feel good at this moment" [inverted], "I wish to leave this situation." Finally, research evaluating various experiences of boredom with respect to different contexts (e.g., leisure time, achievement domain) may provide intriguing results concerning the prevalence of the boredom types in different settings.

Our results may significantly contribute to previous research in the field of psychometric studies on boredom. They do not contradict previous studies that investigated different dimensions of boredom (e.g., disengagement, high arousal, low arousal, inattention, time perception; Fahlman et al. 2013). Rather, they suggest that those dimensions might be seen from the perspective of different types of boredom and not from a prototype perspective.

Further, our findings do not contradict results of studies focusing on antecedents of boredom (e.g., internal vs. external stimulation, lack of meaning, monotony, being over- or under-challenged; Dahlen et al. 2004; Daschmann et al. 2011), but instead expand upon these studies by suggesting that careful examination of antecedents of boredom types could help identify possible reasons for why boredom types develop (e.g., dispositional factors) or are observed in specific situations (e.g., environmental factors).

It is anticipated that future research in which boredom subtypes are considered will shed light on the ongoing discussion concerning the positive as well as negative effects of boredom on critical outcomes in achievement settings and everyday life (see Vodanovich 2003a). More specifically, given the present findings indicating that different types of boredom may differentially correspond to criteria variables, it is likely that varied relations with other outcomes of interest (e.g., health, persistence, learning, creativity, decision making, etc.) will be observed. Further, considering that the prevalence of boredom types was found to differ depending on a situation in which boredom was experienced (achievement vs. non-achievement settings), future studies in which additional and more specific differentiations or manipulations of situation type are employed (e.g., sports as an achievement-oriented leisure setting, shopping for leisure vs. necessity, academic achievement vs. non-academic achievement) may also yield intriguing moderating effects on the prevalence as well as consequences of different boredom types.

Finally, research efforts exploring the temporal development of the different types of boredom as experienced in achievement as well as non-achievement settings may also help to address unexplored hypotheses concerning transitions between boredom types over time. Similarly, future studies may also inform the development of intervention programs aimed at reducing individuals' experiences of boredom, particularly in situations that afford fewer opportunities for changing or withdrawing from boring activities (e.g., the secondary school classroom, older adults in assisted care facilities).

In closing, the present findings are consistent with the assertions of early boredom theorists in suggesting that "...it is probable that the conditions and forms of behavior called 'boredom' are psychologically quite heterogeneous..." (Fenichel 1951, p. 349; see also Fenichel 1934, p. 270 for the original German quote). To our knowledge, this study represents the first quantitative investigation into the internal and external validity of this assumption, and provides encouraging empirical support for a more differentiated perspective on how individuals experience boredom in everyday life. Moreover, whereas our results could help to shed light on a number of ongoing debates concerning the phenomenology, antecedents, and effects of

this ubiquitous emotion, they also highlight the potential utility of exploring within-construct variability in other emotions along dimensions that may otherwise be assumed to represent the entire construct. With respect to enjoyment, for example, it is possible that a subtype of enjoyment characterized by relatively low levels of valence and arousal ("quiet joy") may be differentiated from one high in both dimensions ("excitement"), with other types of enjoyment being observed that fall in between. Similarly, for anger, "silent anger" as compared to "rage" might be the extreme poles for this emotion. Given our results, it is possible that the presumed homogeneity of specific discrete emotions with respect to the dimensions of valence and arousal may be overestimated. Therefore, in contrast to assuming, evaluating, and/or classifying discrete emotional experiences with respect to mean levels of valence and arousal, the present research suggests that discrete emotions may be best explored by examining the existence, prevalence, development, antecedents, and consequences of within-emotion variability along these dimensions, thereby acknowledging the complex nature of individuals' discrete emotions that are experienced in real-life settings.

References

- Amos, A., Wiltshire, S., Haw, S., & McNeill, A. (2006). Ambivalence and uncertainty: Experiences of and attitudes towards addiction and smoking cessation in the mid-to-late teens. *Health Education Research, 21*(2), 181–191. doi:10.1093/her/cyh054.
- Anshel, M. H. (1991). A survey of elite athletes on the perceived causes of using banned drugs in sport. *Journal of Sport Behavior, 14*(4), 283–310.
- Armstrong, S. L., Gleitman, L. R., & Gleitman, H. (1983). What some concepts might not be. *Cognition, 13*(3), 263–308. doi:10.1016/0010-0277(83)90012-4.
- Baird, B., Smallwood, J., Mrazek, M. D., Kam, J. W. Y., Franklin, M. S., & Schooler, J. W. (2012). Inspired by distraction: Mind wandering facilitates creative incubation. *Psychological Science, 23*(10), 1117–1122. doi:10.1177/0956797612446024.
- Bearden, L. J., Spencer, W. A., & Moracco, J. C. (1989). A study of high school dropouts. *School Counselor, 37*(2), 113–120.
- Berlyne, D. E. (1960). *Conflict, arousal, and curiosity*. New York, NY: McGraw-Hill Book Company. doi:10.1037/11164-000.
- Clark, S. L., & Muthén, B. O. (2009). *Relating latent class analysis results to variables not included in the analysis*. Available from <http://www.statmodel.com/download/relatinglca.pdf>.
- Clore, G. L. (1994). Why emotions require cognition. In P. Ekman & R. J. Davidson (Eds.), *The nature of emotion* (pp. 181–191). New York: Oxford University Press.
- Clore, G. L., & Ortony, A. (1991). What more is there to emotion concepts than prototypes? *Journal of Personality and Social Psychology, 60*(1), 48–50. doi:10.1037/0022-3514.60.1.48.
- Csikszentmihalyi, M., & Larson, R. (1987). Validity and reliability of the experience-sampling method. *Journal of Nervous and Mental Disease, 175*(9), 526–536. doi:10.1097/00005053-198709000-00004.
- Dahlen, E. R., Martin, R. C., Ragan, K., & Kuhlman, M. M. (2004). Boredom proneness in anger and aggression: Effects of

- impulsiveness and sensation seeking. *Personality and Individual Differences*, 37, 1615–1627.
- Daschmann, E. C., Goetz, T., & Stupnisky, R. H. (2011). Testing the predictors of boredom at school. Development and validation of the Precursors to Boredom Scales. *British Journal of Educational Psychology*, 81, 421–440. doi:[10.1348/000709910X526038](https://doi.org/10.1348/000709910X526038).
- Ekman, P. (1984). Expression and the nature of emotion. In K. S. Scherer & P. Ekman (Eds.), *Approaches to emotion* (pp. 319–343). Hillsdale, NJ: Erlbaum.
- Fahlman, S. A., Mercer-Lynn, K. B., Flora, D. B., & Eastwood, J. D. (2013). Development and validation of the multidimensional state boredom scale. *Assessment*, 20(1), 68–85.
- Farmer, R., & Sundberg, N. D. (1986). Boredom proneness: The development and correlates of a new scale. *Journal of Personality Assessment*, 50(1), 4–17. doi:[10.1207/s15327752jpa5001_2](https://doi.org/10.1207/s15327752jpa5001_2).
- Fenichel, O. O. (1934). Zur Psychologie der Langeweile. *Imago (Leipzig)*, 20720–281.
- Fenichel, O. (1951). On the psychology of boredom. In D. Rapaport (Ed.), *Organization and pathology of thought: Selected sources* (pp. 349–361). New York, NY: Columbia University Press. doi:[10.1037/10584-018](https://doi.org/10.1037/10584-018).
- Fisher, C. D. (1993). Boredom at work: A neglected concept. *Human Relations*, 46(3), 395–417. doi:[10.1177/001872679304600305](https://doi.org/10.1177/001872679304600305).
- Goetz, T., & Frenzel, A. C. (2006). Phänomenologie schulischer Langeweile [Phenomenology of boredom at school]. *Zeitschrift für Entwicklungspsychologie und Pädagogische Psychologie*, 38(4), 149–153. doi:[10.1026/0049-8637.38.4.149](https://doi.org/10.1026/0049-8637.38.4.149).
- Goetz, T., Bieg, M., Lüdtke, O., Pekrun, R., & Hall, N. C. (2013). Do girls really experience more anxiety in mathematics? *Psychological Science*, 24(10), 2079–2087. doi:[10.1177/0956797613486989](https://doi.org/10.1177/0956797613486989).
- Goetz, T., Frenzel, A. C., & Pekrun, R. (2007a). Regulation von Langeweile im Unterricht. Was Schülerinnen und Schüler bei der “Windstille der Seele” (nicht) tun [Regulation of boredom in class. What students do (not) when experiencing the, windless calm of the soul’]. *Unterrichtswissenschaft*, 35(4), 312–333.
- Goetz, T., Frenzel, A. C., Pekrun, R., & Hall, N. C. (2006). The domain specificity of academic emotional experiences. *Journal of Experimental Education*, 75(1), 5–29. doi:[10.3200/JEXE.75.1.5-29](https://doi.org/10.3200/JEXE.75.1.5-29).
- Goetz, T., Frenzel, A. C., Pekrun, R., Hall, N. C., & Lüdtke, O. (2007b). Between- and within-domain relations of students’ academic emotions. *Journal of Educational Psychology*, 99(4), 715–733. doi:[10.1037/0022-0663.99.4.715](https://doi.org/10.1037/0022-0663.99.4.715).
- Goetz, T., Frenzel, A. C., Stoeger, H., & Hall, N. C. (2010). Antecedents of everyday positive emotions: An experience sampling analysis. *Motivation and Emotion*, 34(1), 49–62. doi:[10.1007/s11031-009-9152-2](https://doi.org/10.1007/s11031-009-9152-2).
- Grubb, E. A. (1975). Assembly line boredom and individual differences in recreation participation. *Journal of Leisure Research*, 7, 256–269.
- Harris, M. B. (2000). Correlates and characteristics of boredom proneness and boredom. *Journal of Applied Social Psychology*, 30(3), 576–598. doi:[10.1111/j.1559-1816.2000.tb02497.x](https://doi.org/10.1111/j.1559-1816.2000.tb02497.x).
- Harrison, A. (1984). Creativity, class, and boredom: Cognitive models for intelligent activities. *Journal of Education, Boston*, 166(2), 150–169.
- Hebb, D. O. (1955). Drives and the C. N. S. (conceptual nervous system). *Psychological Review*, 62(4), 243–254. doi:[10.1037/h0041823](https://doi.org/10.1037/h0041823).
- Hektner, J. M., Schmidt, J. A., & Csikszentmihalyi, M. (2007). *Experience sampling method: Measuring the quality of everyday life*. Thousand Oaks, CA: Sage Publications, Inc.
- Hill, A. B., & Perkins, R. E. (1985). Towards a model of boredom. *British Journal of Psychology*, 76, 235–240.
- Johnson-Laird, P. N., & Oatley, K. (1989). The language of emotions: An analysis of a semantic field. *Cognition and Emotion*, 3(2), 81–123. doi:[10.1080/02699938908408075](https://doi.org/10.1080/02699938908408075).
- Johnstone, T., & Scherer, K. R. (2000). Vocal communication of emotion. In M. Lewis & J. M. Haviland-Jones (Eds.), *Handbook of emotions* (2nd ed., pp. 220–235). New York: Guilford Press.
- Klapp, O. (1986). *Overload and boredom*. New York: Greenwood Press.
- Kleinginna, P. R., & Kleinginna, A. M. (1981). A categorized list of emotion definitions, with suggestions for a consensual definition. *Motivation and Emotion*, 5, 345–379.
- Larsen, J. T., & McGraw, P. (2011). Further evidence for mixed emotions. *Journal of Personality and Social Psychology*, 100(6), 1095–1110. doi:[10.1037/a0021846](https://doi.org/10.1037/a0021846).
- Larson, R. W., & Richards, M. H. (1991). Boredom in the middle school years: Blaming schools versus blaming students. *American Journal of Education*, 99(4), 418–443. doi:[10.1086/443992](https://doi.org/10.1086/443992).
- Lee, T. W. (1986). Toward the development and validation of a measure of job boredom. *Manhattan College Journal of Business*, 15, 22–28.
- London, H., Schubert, D. S., & Washburn, D. (1972). Increase of autonomic arousal by boredom. *Journal of Abnormal Psychology*, 80(1), 29–36. doi:[10.1037/h0033311](https://doi.org/10.1037/h0033311).
- Mikulas, W. L., & Vodanovich, S. J. (1993). The essence of boredom. *The Psychological Record*, 43(1), 3–12.
- Miller, W. R., & Seligman, M. E. (1975). Depression and learned helplessness in man. *Journal of Abnormal Psychology*, 84(3), 228–238. doi:[10.1037/h0076720](https://doi.org/10.1037/h0076720).
- Muthén, B. O. (2001). Latent variable mixture modeling. In G. A. Marcoulides & R. E. Schumacker (Eds.), *New developments and techniques in structural equation modeling* (pp. 1–33). Mahwah, NJ: Lawrence Erlbaum Associates.
- Muthén, B. O., & Muthén, L. K. (2000). Integrating person-centered and variable-centered analysis: Growth mixture modeling with latent trajectory classes. *Alcoholism: Clinical and Experimental Research*, 24(6), 882–891. doi:[10.1111/j.1530-0277.2000.tb02070.x](https://doi.org/10.1111/j.1530-0277.2000.tb02070.x).
- Muthén, L. K., & Muthén, B. O. (2007). *Mplus user’s guide* (5th ed.). Los Angeles, CA: Muthén & Muthén.
- Nett, U. E., Goetz, T., & Daniels, L. M. (2010). What to do when feeling bored? Students’ strategies for coping with boredom. *Learning and Individual Differences*, 20(6), 626–638. doi:[10.1016/j.lindif.2010.09.004](https://doi.org/10.1016/j.lindif.2010.09.004).
- Nett, U. E., Goetz, T., & Hall, N. C. (2011). Coping with boredom in school: An experience sampling perspective. *Contemporary Educational Psychology*, 36(1), 49–59. doi:[10.1016/j.cedpsych.2010.10.003](https://doi.org/10.1016/j.cedpsych.2010.10.003).
- Newberry, A. L., & Duncan, R. D. (2001). Roles of boredom and life goals in juvenile delinquency. *Journal of Applied Social Psychology*, 31(3), 527–541. doi:[10.1111/j.1559-1816.2001.tb02054.x](https://doi.org/10.1111/j.1559-1816.2001.tb02054.x).
- Nylund, K. L., Asparouhov, T., & Muthén, B. O. (2007a). Deciding on the number of classes in latent class analysis and growth mixture modeling: A Monte Carlo simulation study. *Structural Equation Modeling*, 14(4), 535–569.
- Nylund, K., Nishina, A., Bellmore, A., & Graham, S. (2007b). Subtypes, severity, and structural stability of peer victimization: What does latent class analysis say? *Child Development*, 78(6), 1706–1722.
- Ortony, A., Clore, G. L., & Foss, M. A. (1987). The referential structure of the affective lexicon. *Cognitive Science: A Multidisciplinary Journal*, 11(3), 341–364.
- Papaioannou, A., Marsh, H. W., & Theodorakis, Y. (2004). A multilevel approach to motivational climate in physical education and sport settings: An individual or a group level construct? *Journal of Sport & Exercise Psychology*, 26(1), 90–118.
- Pekrun, R., Elliot, A. J., & Maier, M. A. (2009). Achievement goals and achievement emotions: Testing a model of their joint relations with academic performance. *Journal of Educational Psychology*, 101(1), 115–135. doi:[10.1037/a0013383](https://doi.org/10.1037/a0013383).

- Pekrun, R., & Frese, M. (1992). Emotions in work and achievement. In C. L. Cooper & I. T. Robertson (Eds.), *International review of industrial and organizational psychology* (Vol. 7, pp. 153–200). Chichester: Wiley.
- Pekrun, R., Goetz, T., Daniels, L. M., Stupnisky, R. H., & Perry, R. P. (2010). Boredom in achievement settings: Exploring control-value antecedents and performance outcomes of a neglected emotion. *Journal of Educational Psychology*, 102(3), 531–549. doi:10.1037/a0019243.
- Pekrun, R., Goetz, T., Titz, W., & Perry, R. P. (2002). Academic emotions in students' self-regulated learning and achievement: A program of qualitative and quantitative research. *Educational Psychologist*, 37(2), 91–106. doi:10.1207/S15326985EP3702_4.
- Perkins, R. E., & Hill, A. B. (1985). Cognitive and affective aspects of boredom. *British Journal of Psychology*, 76(2), 221–234.
- Phillips, A. (1993). *On kissing, tickling, and being bored: Psychoanalytic essays on the unexamined life*. Cambridge, MA: Harvard University Press.
- Reisenzein, R. (1994). Pleasure-arousal theory and the intensity of emotions. *Journal of Personality and Social Psychology*, 67, 525–539.
- Robinson, M. D., & Barrett, L. F. (2010). Belief and feeling in self-reports of emotion: Evidence for semantic infusion based on self-esteem. *Self and Identity*, 9, 87–111. doi:10.1080/15298860902728274.
- Robinson, M. D., & Clore, G. L. (2002). Belief and feeling: Evidence for an accessibility model of emotional self-report. *Psychological Bulletin*, 128(6), 934–960. doi:10.1037/0033-2909.128.6.934.
- Rosch, E. (1978). Principles of categorization. In E. Rosch & B. B. Lloyd (Eds.), *Cognition and categorization* (pp. 27–48). Hillsdale, NJ: Erlbaum.
- Roseman, I. J., Antoniou, A., & Jose, P. E. (1996). Appraisal determinants of emotions: Constructing a more accurate and comprehensive theory. *Cognition and Emotion*, 10(3), 241–277. doi:10.1080/026999396380240.
- Rupp, D. E., & Vodanovich, S. J. (1997). The role of boredom proneness in self-reported anger and aggression. *Journal of Social Behavior & Personality*, 12(4), 925–936.
- Russel, J. A. (1991). In defense of a prototype approach to emotion concepts. *Journal of Personality and Social Psychology*, 60(1), 37–47.
- Russell, J. A. (1980). A circumplex model of affect. *Journal of Personality and Social Psychology*, 39(6), 1161–1178. doi:10.1037/h0077714.
- Scherer, K. R. (1984). On the nature and function of emotion: A component process approach. In K. R. Scherer & P. Ekman (Eds.), *Approaches to emotion* (pp. 293–317). Hillsdale: Lawrence Erlbaum.
- Scherer, K. R. (2000). Emotions as episodes of subsystems synchronization driven by nonlinear appraisal processes. In M. D. Lewis & I. Granic (Eds.), *Emotion, development, and self-organization* (pp. 70–99). Cambridge: Cambridge University Press.
- Schwarz, G. (1978). Estimating the dimension of a model. *The Annals of Statistics*, 6(2), 461–464. doi:10.1214/aos/1176344136.
- Seib, H. M., & Vodanovich, S. J. (1998). Boredom proneness and psychosocial development. *The Journal of Psychology*, 132, 642–652.
- Shaver, P., Schwartz, J., Kirson, D., & O'Connor, C. (1987). Emotion knowledge: Further exploration of a prototype approach. *Journal of Personality and Social Psychology*, 52(6), 1061–1086.
- Sio, U. N., & Ormerod, T. C. (2009). Does incubation enhance problem solving? A meta-analytic review. *Psychological Bulletin*, 135, 94–120.
- Smith, R. P. (1981). Boredom: A review. *Human Factors*, 23(3), 329–340.
- Sommer, B. (1985). What's different about truants? A comparison study of eighth-graders. *Journal of Youth and Adolescence*, 14(5), 411–422. doi:10.1007/BF02138836.
- Sommers, J., & Vodanovich, S. J. (2000). Boredom proneness: Its relationship to psychological- and physical-health symptoms. *Journal of Clinical Psychology*, 56(1), 149–155. doi:10.1002/(SICI)1097-4679(200001)56:1<149::AID-JCLP14>3.0.CO;2-Y.
- Spacks, P. M. (1995). *Boredom: The literary history of a state of mind*. Chicago, IL: University of Chicago Press.
- Thackray, R. I. (1981). The stress of boredom and monotony: A consideration of the evidence. *Psychosomatic Medicine*, 43(2), 165–176.
- Titz, W. (2001). *Emotionen von Studierenden in Lernsituationen. Explorative Analysen und Entwicklung von Selbstberichtskaalen* [Students' emotions in learning situations]. Münster: Waxmann.
- Van Tilburg, W. A. P., & Igou, E. R. (2012). On boredom: Lack of challenge and meaning as distinct boredom experiences. *Motivation and Emotion*, 36, 181–194.
- Vodanovich, S. J. (2003a). On the possible benefits of boredom: A neglected area in personality research. *Psychology and Education: An Interdisciplinary Journal*, 40(3–4), 28–33.
- Vodanovich, S. J. (2003b). Psychometric measures of boredom: A review of the literature. *Journal of Psychology: Interdisciplinary and Applied*, 137(6), 569–595. doi:10.1080/00223980309600636.
- Wallbott, H. G. (1998). Bodily expression of emotion. *European Journal of Social Psychology*, 28, 879–896.
- Wang, C. P., Brown, C. H., & Bandeen-Roche, K. (2005). Residual diagnostics for growth mixture models: Examining the impact of preventive intervention on multiple trajectories of aggressive behavior. *Journal of the American Statistical Association*, 100(3), 1054–1076. doi:10.1198/016214505000000501.
- Watson, D., & Tellegen, A. (1985). Toward a consensual structure of mood. *Psychological Bulletin*, 98(2), 219–235. doi:10.1037/0033-2909.98.2.219.
- Wilson-Mendenhall, C., Barrett, L. F., & Barsalou, L. W. (2013). Neural evidence that human emotions share core affective properties. *Psychological Science*, 24, 947–956. doi:10.1177/0956797612464242.
- Zeidner, M. (1998). *Test anxiety: The state of the art*. New York, NY: Plenum Press.
- Zeidner, M. (2007). Test anxiety: Conceptions, findings, conclusions. In P. A. Schutz & R. Pekrun (Eds.), *Emotion in education* (pp. 165–184). San Diego: Academic Press.